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ABSTRACT

This study investigates the onset at periodic intervals in the age range of about two to five years of various kinds of recurrent and systematic errors in word choice and/or syntactic structure. Acquisitional processes and their implications are outlined. Sections address: (1) the kinds of processes that can be inferred to underlie errors ("late errors") that do not set in until after a period of correct usage; (2) the currently dominant model of how linguistic forms, meaning, and communication are interrelated in the acquisition of language; (3) challenging problems for this model; (4) a suggestion that the notion of "meaning" in language must be reconceptualized before the problems can be solved; and (5) evidence from several types of late errors that supports the arguments. The error types discussed show the ways in which the relationship between form and meanings can change in the course of language development. These changes occur after the child would ordinarily already be credited with having "acquired" the forms in question. This indicates that achieving fluent, productive use of a form and achieving adult-like knowledge of its structure are not necessarily isomorphic. (Author/JK)

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TO AN INTEGRATED SYSTEM IN THE CHILD'S ACQUISITION OF LANGUAGE

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BEYOND COMMUNICATIVE ADEQUACY:
FROM PIECEMEAL KNOWLEDGE TO AN INTEGRATED SYSTEM
IN THE CHILD'S ACQUISITION OF LANGUAGE*

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Introduction

When I began observing and recording the language development of my two daughters, Christy and Eva, in the early 1970s, the major landmarks in the acquisition of English were well-known: the stage of one-word utterances, the onset of short telegraphic sentences, overextensions, inflectional overregularizations, and so on. My purpose in collecting data was thus not so much exploratory as to establish a rich, fine-grained data base for investigating known problems such as the scope and nature of the categories underlying early word combinations. As the children passed the initial stages of vocabulary acquisition and syntactic development, however, I began to notice phenomena I had not been looking for: the onset, at periodic intervals in the age range of about 2 to 5, of various kinds of errors in word choice and/or syntactic structure, long after my earlier observations had led me to assume that the form in question had already been mastered. Some types of errors occurred relatively frequently, others relatively infrequently. Whether frequent or infrequent, however, they were recurrent and systematic. Moreover, as I realized when I began listening with a freshly sensitized ear, the errors were not unique to my home-grown subjects but in fact turn up repeatedly in the speech of other English-speaking children of comparable ages.

At first these errors struck me as intriguing but isolated oddities in the development of English. The more I have thought about them, however, the more I have become convinced that their modest initial appearance is deceptive: to account for them adequately in fact requires positing acquisitional processes of considerable theoretical significance. My goal in this presentation will be to outline these processes and discuss some of their implications. I am particularly happy to do this at the Stanford Forum, since it was here that I reported on the "first errors" in 1974, and here also that, three years later, I gave the next report, with the growing suspicion that something of more general interest was involved than simply mistakes with causative verbs.

*Keynote Address, Thirteenth Annual Child Language Research Forum, Stanford University, April 24, 1981. The research reported here was supported in part by Grant HD00870 from NICHD and by a Fellowship from the Netherlands Institute for Advanced Study in the Humanities and Social Sciences, Wassenaar, The Netherlands. In developing these ideas I have benefited greatly from discussions in the last few years with many colleagues, including in particular Robin Campbell, Eve Clark, Dedre Gentner, Mike Maratsos, Dan Slobin, and Leonard Talmy.

The paper is organized as follows. The first section below considers very briefly the kinds of processes that can be inferred to underlie errors that do not set in until after a period of correct usage (hereafter "late" errors). It is argued that such errors necessitate rethinking the question of what it means to "acquire" a piece of linguistic knowledge: "acquisition" often seems to be a more extended process than we have envisioned, continuing on long after adequate communication has been achieved with respect to a given form, and sometimes involving covert shifts in the way the child has organized linguistic information and related it to other parts of his developing grammar.

The ongoing organization and reorganization of linguistic knowledge is a fascinating phenomenon in its own right. It takes on added significance, however, when we consider its implications for a complex theoretical issue of the greatest current importance: the role of meaning and the child's intention to communicate meaning in the acquisition of language. I therefore defer the discussion of some particular error types until after the second and third sections, in which I outline the currently dominant model of how linguistic forms, meaning, and communication are interrelated in the acquisition of language, point out some challenging problems for this model, and suggest that the notion of "meaning" in language must be reconceptualized before we can hope to solve these problems. In the fifth section, evidence from several types of late errors is marshalled in support of these arguments. A brief concluding section follows.

What causes late errors?

Little explicit attention has been paid in the child language literature to the general phenomenon of errors that set in only after a period of correct usage. Nevertheless, every student of language development is well acquainted with one such sequence, the onset of inflectional overregularizations (e.g., goed, foots) only after the child has been using the correct irregular forms (went, feet) for a while (Ervin, 1964, Cazden, 1968). The accepted interpretation for this sequence is that the child starts out by learning lexical items, both inflected and uninflected, regular and irregular, as independent items, i.e., "stored fragments... which are somehow tagged liberally for semantic information on the verbal and nonverbal context" (Cazden, 1968: 437). Later he begins to compare forms and to discover regular relationships -- statable as rules -- holding among subsets of them.¹ At this point the child begins to apply the rules too broadly, and irregular forms are regularized. When the irregular forms later reassert themselves they presumably no longer function as isolates, but rather take their place in the system as exceptional counterparts to their noninflected partners.

¹Terms like "compare," "discover," "recognize," "perceive" and "grasp" imply conscious awareness. However, for lack of better terms they are used in this paper to designate cognitive processes assumed to be wholly unconscious.

This account of the acquisition of inflected forms contains an important insight: that what appears to be "the same" linguistic behavior at two stages of the child's development may in fact be supported by very different kinds of linguistic knowledge: piecemeal fragments of information about particular forms and how to use them at an earlier time, and a system that interrelates and integrates these fragments later on. Because of this ambiguity of surface behaviors (which, it should be noted, is also found in children's approach to nonlinguistic cognitive tasks; cf. Karmiloff-Smith & Inhelder, 1974/75, and papers in Strauss, in press), researchers have wisely tended to exercise caution in attributing to the child full adult knowledge of the forms he produces. However, it is unclear how cautious is cautious enough. Usually if a child is found to be producing a word, inflection, or pattern for sentence construction with semantic accuracy and at least moderate frequency and reasonable flexibility with respect to nonlinguistic and/or surrounding linguistic context, we have been willing to conclude that the form has been "acquired" and we do not look for further development. After all, if the child's use of the form is virtually indistinguishable from that of the adult, what remains to be done?

In some linguistic domains, indeed probably nothing. But in others the child apparently does not stop at the point where outwardly adult-like behavior has been achieved. Rather, he goes on analyzing the elements of his existing repertoire and discovering further relationships and regularities. The result is the gradual transformation of a loose collection of independent linguistic elements, routines, and relatively small sets of interrelated items into a tighter, more structured system that integrates more items and sets of items on the basis of increasingly abstract, overarching rules and relationships. This process is largely covert; the child continues for the most part to speak as before. But, just as in the familiar domain of inflectional morphology, the evidence that it is taking place lies in the occasional error.

What kinds of reorganizational processes do late errors signal? What are the bases for systematization? Speaking globally, the processes seem to involve changes in the kinds of connections the child has initially established between meanings and linguistic forms. This is what makes late errors so relevant to the problem of how meaning and form are interrelated in the acquisition of language, an issue to which we now turn before going on to discuss the errors in more detail.

The primacy of meaning in current thinking about language development

In an earlier era, no causal or facilitative role was ascribed to meaning in the acquisition of linguistic forms (words, inflections, word order and intonation patterns, part-of-speech categories, grammatical functions like sentence-subject, etc.). The meanings encoded by forms were either largely ignored in studies of language development — especially in the case of syntax — or considered to emerge in the child as a direct consequence of her learning of language. A striking shift has taken place over the last decade, however. Now, far

from being considered irrelevant to or determined by language acquisition, meaning is commonly seen as the key to the whole process.²

According to this more recent view, the child possesses powerful cognitive skills that enable her to structure and interpret her experiences on a nonlinguistic basis — that is, to develop notions of agency, spatial location, causality, possession, and so on. When language starts to come in, it does not introduce new meanings to the child. Rather, it is used to express only those meanings the child has already formulated independently of language.

How are specific linguistic forms acquired? The hypothesis is that new forms are matched to -- "map onto" -- pre-established concepts or categories of meaning. These meanings may not be isomorphic with the adult meanings identified with the forms in question; the point is simply that each form is matched to some pre-established meaning, whatever it might be. Once the mapping has taken place, the meaning category guides the child's initial generalizations of the form to novel contexts; that is, the child uses the form only in connection with the meaning with which she has identified it. A sketch illustrating this general approach to the developmental relationship between form and meaning is presented in Figure 1, along with some representative hypotheses about specific form-meaning matches in English-speaking children.

FIGURE 1

<u>Cognition</u>		<u>Language Forms</u>
"Meanings" to be expressed arise from child's nonlinguistic organization and categorization of his environment:	map into —————→ ←———— are mapped onto	words, inflections, word order and intonation patterns, parts of speech, etc.:
round (rolling, bouncing) object		<u>ball</u> (Clark, 1973; Nelson, 1974)
action/concrete object/attribute		verb/noun/adjective (i.e., the set of syntactic and morphological privileges that define these parts of speech; Bates & MacWhinny, in press)
past action resulting in present state		<u>-ed</u> (Antinucci & Miller, 1976)
agent (or topic, or both)		sentence subject (Bowerman, 1973; Bates & MacWhinny, in press)
"prototypical causal event" (a particular type of agent-action-object sequence)		N-V-N (Slobin, 1979)

What is the motor that drives this mapping process? Here is where communication enters the picture. If language acquisition is seen primarily as a process of mapping linguistic forms onto pre-established meanings, it is a plausible step to the hypothesis that new forms enter the child's repertoire in response to the child's desire or intention to express his meanings. This view is sometimes implicit in the literature, discernable, for example, in the interchangeable use of the terms "meaning" (or "semantic/pragmatic function") and "communicative intention". More explicit proposals have also been advanced, e.g., Bates and MacWhinney's (in press) interpretation of linguistic progress as a series of solutions to communication problems. The general idea is that the development of new or more differentiated meanings is always in advance of the child's knowledge of the conventional linguistic devices for expressing them. At first she "makes do" with whatever nonlinguistic means (e.g., gestures, eye contact) and linguistic devices are available to her. But the "push" from the mounting complexity of her communicative intentions leads her to seek and master ever more elaborate linguistic devices that will allow her to express these intentions more satisfactorily.

Some problems with this approach

The model sketched above is attractive in part because it invokes and interrelates in an internally coherent way a number of themes that have become important in the study of language development (and language more generally) over the last decade, such as meaning, communication, and the way language structure may reflect both nonlinguistic conceptual predispositions and the requirements of a communication system that must be processed in a linearly organized, temporally fading medium. Despite its appeal, however, many serious problems arise when we begin to look closely at some of the model's assumptions and predictions. We will consider questions about formal structure only briefly, and then go more deeply into the problem of meaning.

Form

Are new forms always and necessarily matched to pre-established categories of meaning, or is the child in fact capable of dealing with formal structure without support from meaning? The most interesting cases for this question are those in which formal distinctions of the adult language do correlate with categories of meaning, but only partially (e.g., many but not all nouns, verbs, and adjectives name concrete objects, actions, and attributes, respectively; many sentence-subjects name agents who perform an action [John walked] but others do not [John received a present]). Investigators working within the framework sketched in Figure 1 suggest that children exploit partial correlations

²Although most of the subsequent discussion focusses on meanings traditionally considered "semantic," I intend the term "meaning" to be taken broadly here to include at least certain "pragmatic" concepts such as topic, given-new, etc.

like these to crack into the formal system (e.g., Bates & MacWhinney). If so, children should at first use a given form only in the context of its associated meaning; e.g., apply verb inflections only to words naming actions. Once having achieved a working knowledge of a form, however, they would begin to extend the use of the form to contexts in which the meaning is absent. This transition could occur gradually, e.g., with extension moving from core or prototypical instances of the meaning to "less good exemplars" or metaphorically related meanings, and finally to nonexemplars (cf. Slobin, 1979).

Maratsos and Chalkley (1981) challenge this general approach to the problem, however. They point out that the hypothesis predicts certain kinds of errors in the early stages of acquiring particular forms, such as treating adult verbs that refer to attributive states rather than actions (e.g., love) as adjectives, and adjectives that refer to actions or behaviors rather than attributes (e.g., [be] nasty [to]) as verbs. These errors do not occur, however. They conclude from this and related evidence that children are capable of learning grammatical forms that correlate poorly with categories of meaning without semantic mediation. Experimental evidence that this is indeed possible is presented by Karmiloff-Smith (1979a), who found that French-speaking children learn a great deal about the formal properties of the French gender system long before they grasp that, in the case of nouns with animate referents, gender correlates highly with a real-world meaning distinction, sex of referent.

Meaning

So far the question has been simply whether formal knowledge is invariably or necessarily acquired with the help of meaning. The answer apparently is no. But there are still murkier problems with the hypothesis that the child proceeds by mapping the formal devices of language onto her communicative intentions. Specifically, the hypothesis assumes a relationship between language and thought that is implausibly direct, given considerations of the following kinds.

1. Selectivity in the mapping of meanings. One reason that language cannot be taken as a direct map of thought is discussed at length by Slobin (1979). Slobin points out that languages are selective in what they encode, pulling out only certain meaning distinctions for obligatory marking and ignoring others that the speaker is presumably equally capable of entertaining. Moreover, different languages are selective in different ways. This means, points out Slobin, that the child needs to learn not only how to encode meanings but which meanings to encode: "the child learner needs to determine which particular subset of notions receives formal marking in his or her native language" (p.7). How the child does this is not accounted for in the "forms map onto pre-established meanings" model.

2. Backgrounded meanings vs. the message being communicated. The model under consideration makes no distinction between "meaning" and "the (elements) of the message the speaker wishes to communicate."

Does this approach do justice to the role of meaning in the structure of language? Indeed it does not. We must already doubt it when, with Slobin (1979), we consider the problem of selectivity from a cross-linguistic perspective, because formal markers that are obligatory in one language or another often encode meanings that, watching the children in our own living rooms, we find hard to imagine the young child is likely to be driven to communicate of his own accord (e.g., the distinction between whether a past event is known by direct experience or by inference or hearsay, essential to the choice between alternative past tense markers in Turkish). It is more likely that the child learns through experience with language that these meanings must be encoded, whether he is spontaneously interested in communicating them or not (see Bowerman, 1976:131-132 and Schlesinger, 1977:157 for relevant discussion).

But reasons for rejecting the equation between "meaning" and "communicative intentions" or "what the child wants to express" go deeper than the problem of cross-linguistic differences with respect to which meanings are encoded. It is not unreasonable to suppose that after experience with language, the Turkish speaker's intended message comes to include information about how a past event is known. This would not account for how the speaker learned the past tense forms in the first place, but it would at least allow us to preserve the idea that "message" and "meaning" are somehow isomorphic. But meaning is woven into the structure of language in other, more subtle ways: in particular, the speaker must control a wide variety of semantic categories that govern the applicability of various linguistic forms but do not in themselves constitute any part of the message to be communicated.

This can best be illustrated by example. It is often observed that young children extend the word ball to novel referents on the basis of shape: roundness (Clark, 1973). When the child says ball while pointing out or requesting a ball or other round object, is she intending to communicate that the object is round? This is unlikely. Roundness plays an important role in her choice of word to label the referent she has in mind, but it is not in itself part of the message being conveyed.³

Although roundness is not part of the young child's communicative intent when she says ball, it can play a foregrounded role in other utterances. That is, the meaning "round" can either serve the subordinate role of influencing the choice of forms with which some other message is communicated, or it can be part of a message itself, as in "Let's use the round placemats today." (Notice, though, how much later

³ See Campbell (1978) for a more general discussion of the tendency in studies of language and language development to confuse conscious and unconscious processes, e.g., the distinction between linguistic contents of which the speaker is aware and those of which he is not.

the child learns a word like round than she learns a word like ball, which calls upon the roundness meaning less directly). But other backgrounded meanings are more elusive, never entering the speaker's conscious awareness at any time even though his use of language demonstrates that he controls them. Whorf (1956) described a number of these meanings, terming them "covert categories" or "cryptotypes."

Covert meanings typically have no explicit formal marker associated with them in the way -s, for example, is associated with the notion of plurality. Rather, they are detectible only through the constraints they place on the way other forms combine. An excellent example is the meaning associated with English verbs that can be prefixed with reversible un-, as in untie, unbuckle, unfasten, uncover, unwrap, and uncoil.⁴ Whorf points out that the base verbs (given in capitals) form a semantic set: they all involve an action in which things move together, join up, or become tighter or more contracted. English has no reversible verbs in which un- is prefixed to a verb naming an action that involves things coming apart, becoming looser, etc., even though semantically these would often make sense, e.g., please UNBREAK my toy (= fix, put together); you can UNMELT the candybar by putting it in the freezer (= cause to resolidify). Whorf argued that fluent speakers of English have an implicit feel for the elusive semantic category associated with verbs that can be un-ed, and would know immediately whether a novel verb could be prefixed with un- to form a verb specifying the reversal of the action. This claim is supported by language acquisition data, as we shall discuss later.

To summarize, the notion of "meaning in language" is not exhausted by an explication of "communicative intentions." A speaker's communicative intentions at the moment of speech can be described as a representation of the objects, events, relationships, etc., he plans to talk about, along with subsidiary information about what is more important, what is less important, and so on. But the speaker's selection and combination of particular linguistic forms with which to express these intentions is guided by meanings that are not being consciously entertained at that moment, and that in many cases are never consciously entertained at all. The view of language acquisition as a process of mapping linguistic forms onto pre-established meanings that the speaker wants to express or communicate is ill-suited to explaining this use of backgrounded meanings in the service of other, more explicit meanings. Yet this ability is inherent to the knowledge and use of language from first words on, and no theory of language acquisition can be considered adequate unless it accounts for it.

3. What are the child's units of meanings? One of the most striking characteristics of language as a representational system is

⁴Do not confuse with un- prefixed to adjectives (unkind, unbroken), which has a different meaning (roughly, not) and imposes fewer restrictions on the base form.

that it does not offer a unique symbol for every discriminably different stimulus, but rather functions in terms of categories, or groups of stimuli that are treated as equivalent. The ability to categorize is one of the most basic cognitive capacities and does not in itself depend on language. Nevertheless, the hypothesis that language acquisition proceeds by a process of mapping linguistic forms onto pre-established meanings -- by which is understood categories of meaning, such as agency, possession, and plurality -- raises the question of whether the child's nonlinguistic experiences lead him to divide up the world either to the extent to which language requires, or into just the kinds of chunks or units needed. This is a complex issue that cannot be considered in detail here (see Bowerman, 1976, and Schlesinger, 1977, for further discussion). For present purposes we will consider only one problem: the "size" of the units.

Two kinds of questions can be posed about category size. One concerns breadth -- what is the range of items that will be treated similarly, e.g., called by the same word or covered by the same inflection? Is doggie used as a label for the house pet, for all small dogs, all dogs, or all four-legged creatures? Does -ed represent only past events with current consequences (e.g., spilled), or past events in general? It is well recognized that the breadth of the category that a child associates with a particular form may narrow or broaden over time. Consonant with the hypothesis that forms are initially mapped onto meanings established independently of language, the assumption is typically that nonlinguistic biases for categorizing in certain ways will exert their maximum influence early in the history of the child's use of a form, with category boundaries later being adjusted, where necessary, to the requirements of the specific language being learned (e.g., Slobin, 1979). We shall see that there is evidence for the opposite course of development as well, however.

The second question about category size concerns the way in which the structure of language breaks down complex events into smaller conceptual chunks and assigns these chunks to words or other forms. Talmy (1975, in press) shows that languages differ systematically in the kinds of semantic configurations to which single-word verbs are attached. Consider, for example, events in which an entity moves with respect to another entity along a certain path and in a certain manner. English has many verbs that "conflate" or combine the notion of movement with the notion of manner; in sentences with these verbs, information about path is expressed with a separate word, a preposition. For example: John HOPPED/ROLLED/STUMBLED/SWAM into/out of/across the cave. The verbs of Romance languages, in contrast, typically conflate motion with path; manner, if it is expressed at all, must be encoded by a separate word. This pattern is suggested by the following possible but uncolloquial English sentences: John ENTERED (=went into)/EXITED from (=went out of)/TRAVERSED (=went across) the cave (while) hopping/rolling/running/stumbling/swimming. Languages differ with respect to their most typical patterns of conflating semantic material, but even within one language there are often alternative ways to distribute elements of meaning across a set of syntactically organized morphemes, cf. the

above examples and also The news saddened me vs. The news made me sad;
I bicycled/flew/walked to work vs. I went to work by bicycle/by airplane/
on foot.

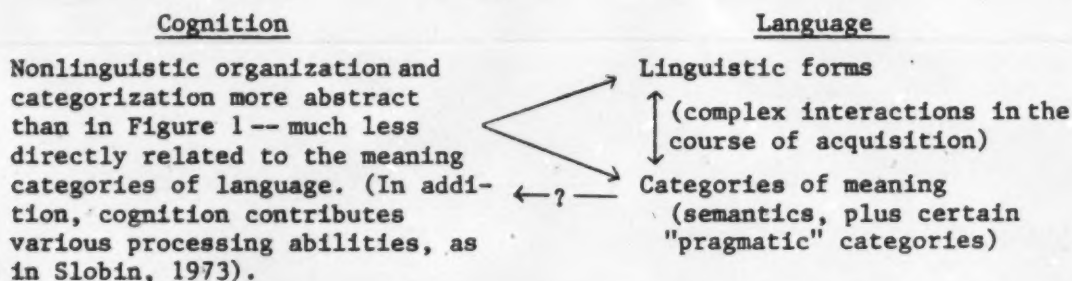
These cross-linguistic and within-language options for the way meaning is packaged raise perplexing questions for the "forms map onto pre-established meanings" hypothesis, especially given the common corollary assumption that children initially prefer a one-to-one mapping between underlying meanings and surface forms (cf. Slobin's 1973 Operating Principle, "Underlying semantic relations should be marked overtly and clearly"). Do the meanings mapped into go in and go down vs. entrer and descendre in English and French, respectively, consist of two conceptual units — motion and path — or one? If two units, then English-speaking children would find the mapping process easier than their French-speaking counterparts, since the latter would be stymied in their efforts to give overt marking to each of the two meaning components. If one unit, on the other hand, then English, by "unnaturally" splitting the conceptual package into two pieces, complicates things for the child who must learn it. Given the lack of evidence for selective difficulties with the learning of words for everyday meanings such as "going in," "going up," and "going down," it is more likely that the child's nonlinguistic conception of these meanings is neutral between the two analyses — i.e., it maps equally readily into either one. If this is the case, however, we cannot maintain the idea that forms map in one-to-one fashion directly onto pre-established categories of meanings. We must instead postulate an intermediate step in which the semantic categories required by the structure of the language being learned are constructed out of the resources provided by nonlinguistic cognition.

An alternative approach to meaning

The various considerations raised above — variability in the way different languages select meanings for obligatory encoding, the role of backgrounded meanings that guide the speaker's selection and combination of forms but that are not in themselves part of the intended message, and cross-linguistic differences in the make-up of the categories to which forms are attached — suggest that the model of the developmental relationship between form and meaning sketched in Figure 1 not only oversimplifies the problem but is in certain critical respects simply wrong. Specifically, there is no room in the model for an account of how the child acquires the meaning structure of his language. In Figure 1, meaning is sacrificed to form; that is, the explanation of how linguistic forms are acquired is bought by granting the child for free, courtesy of nonlinguistic cognitive development, the meanings they encode. The price we pay for this explanation is too high. I certainly do not dispute that we need to take into account the contribution to language development of the child's nonlinguistic abilities, but at the same time we must recognize that the way in which a particular language structures meaning is just as much a part of that language as its formal devices; in other words, it is equally part of what the child must learn. In Figure 2 I sketch informally how the model of Figure 1 must be altered to take account of this; note in particular that meaning

(including both semantics and "pragmatic" categories of various sorts that I have not dealt with here, e.g., distinctions of age, rank, setting, etc. that are relevant to the choice between linguistic variants in concrete situations) has been promoted out of cognition into the domain of language, what is to be learned. New forms can still be mapped directly onto meanings given by nonlinguistic cognition, as in Figure 1; however, meanings can also develop as a consequence of attention to linguistic forms, presumably with assistance from the child's nonlinguistic ability to notice, discriminate, and group stimuli. Whether or how such meaning categories, once learned, affect nonlinguistic cognition is still an open question (as shown by the question mark).

FIGURE 2



Evidence from late errors
for the development, reorganization and
systematization of form-meaning relationships
in the course of language acquisition

So far, arguments for a model such as is proposed in Figure 2 have been based primarily on theoretical considerations. But late errors provide one important kind of empirical support. In particular, they indicate that the initial matches the child makes between forms and meanings are relatively fragmented and context-bound (this argument has recently been made by Karmiloff-Smith (1979a) as well, who, among other things, analyzed errors made by French-speaking children in experimental settings). These matches are serviceable, however; in fact the child can often achieve quite adult-like usage patterns without doing more. Nevertheless, she does do more: elements of the existing repertoire are gradually reworked into form-meaning relationships that are increasingly abstract and removed from the contexts of learning, both in response to subtle regularities across forms within the language being learned and in response to nonlinguistic categorizational predispositions. The result is a highly abstract system that reflects both language-specific structuring principles and more general cognitive biases that played little or no role in the initial "acquisition" of the forms in question.

Examples of three different genres of late errors are given in support of this claim.

1. Learning semantic categories that govern/correlate with the applicability of linguistic forms.

As discussed earlier, the "forms map onto pre-established meanings" hypothesis holds that the child exploits correlations between categories of meaning and linguistic forms to learn about those forms. Thus, for example, "if it is a word that names an action, you can add to it -ed, -ing, etc."). Another possibility, however, is that the child learns the morphological and/or syntactic handling of individual words piecemeal, and only later, after he already has excellent control over these words, discovers that items that behave alike morphologically or syntactically may also share an abstract meaning. (Thus, "if it is a word that can take -ed, -ing, etc., it is likely to name an action"). This is how Brown (1957), in a more Whorfian era, interpreted the ability of preschoolers to guess the referent (action, discrete object, substance) for novel verbs, count nouns, and mass nouns. A number of kinds of late errors support the hypothesis that recognition of abstract form-meaning correspondences often takes place quite late, long after the child is capable of using exemplars of the form fluently (with each exemplar presumably mapped onto a "smaller", less abstract meaning).

Verbs prefixable with UN-. One example of a form-meaning correspondence that may often be recognized only late involves the covert category associated with reversative un- prefixation, discussed earlier. Children learn many legitimate un- verbs (e.g., untie, unbuckle, unfasten) and use them appropriately for at least one to two years before they show signs of having analyzed them into two components. Evidence that the analysis has taken place is that the child starts to produce novel reversative verbs prefixed with un-. Although some children appear to limit their coinage to verbs of the appropriate semantic category right from the start of productivity, others clearly do not (Bowerman, in press b).

Christy's production of novel verbs prefixed with un- went through two distinct stages. At first, un- was prefixed indiscriminately to verbs of a wide variety of semantic types, including those having meanings directly opposite to the covert category of "actions in which objects come together, join up" (etc.). For example:

- (1) C,4,7: C: I hate you! And I'll never unhate you or nothing!⁵
 M: You'll never unhate me?
 C: I'll never like you.
- (2) C,4,5: C: (asks why pliers are on table)
 M: I've been using them for straightening the wire.
 C: And unstraightening it? (= bending; a direct violation of the covert category).

(Similarly: uncome [= stop coming], undizzying [= becoming not dizzy])

⁵ Age in years, months. In this and subsequent examples, C = Christy, E = Eva, M = Mother, D = Daddy.

After many months, however, un- prefixation gradually became limited to verbs of the "right" semantic type, e.g.:

- (3) C,5,1: (M working on strap of C's backpack)
 M: Seems like one of these has been shortened, somehow.
 C: Then unshorten it. (= lengthen)
- (4) C,5,1: He tippitoeed to the grave yard and unburied her. (Telling ghost story)

(Other ~~like~~ coinages involving the "right" kind of verb: to unhang [take down off wall], uncapture [release], unsqueeze [loosen], unweed [take weeds out], see Bowerman, in press b, for further examples and discussion).

Notice that all these examples are "errors" from the adult point of view. But the later ones are more sophisticated, for they show that the child has done further analysis of the semantic characteristics of the set of "real" verbs prefixed with un- that she has learned from other speakers. A critical challenge for those who invoke "communication problems" to account for change and progress in language development is to explain why the child "bothers" to identify this kind of correspondence between a form and an abstract meaning, given that a) she does not need it in order to learn or use the un- verbs in the English lexicon, and that b) it is unlikely that adult reaction to coinages selectively encourages errors like 3 and 4 while discouraging those like 1 and 2. It may be that the child "bothers" simply because she is made that way -- i.e., she is sensitive to structure and regularity in language regardless of whether the detection of it wins her any communicative advantage.

Talking about manner of causation. A second piece of evidence for children's formulation of abstract categories of meaning that correlate with linguistic forms involves the expression of causal relations. Consider phrases like pull your socks up, cut the string off, pound the peg down, eat your cereal allgone and wipe the table dry. Children begin to produce simple sentences containing such phrases as early as age two, and do so with enough flexibility that there can be no talk of "unanalyzed units" -- that is, they vary the noun phrases naming the objects acted upon, and also combine (for example) pull not only with up but also with down, out, in, etc. as the context demands; and up (etc.) not only with pull but also with push, pound, and so on. To all outward appearances, they have excellent control over sentences like these. In the case of Christy and Eva, therefore, I was startled when well over a year later, sentences such as those shown in Table 1 started to occur (a couple of similar examples from other children are included as well).

In reading what linguists have said about sentences like these for help in understanding children's errors, I found that there have been two basic types of analyses. One interprets phrases like pull up and cut off as two-part verbs; sentences containing them are considered simple

TABLE 1
Errors in the Expression of Cause-and-Effect Relations

1. C,3,8: I pulled it unstapled. (After pulling a stapled book apart).
2. E,6,0: His doggie bited him untied. (Telling about TV show in which dog bites ropes, freeing master)
3. E,3,9: A gorilla captured my fingers. I'll capture his whole head off. His hands too. (As plays with rubber band around fingers)
4. Andrea, 4,3: When you get to her, you catch her off. (She is on a park merry-go-round with doll next to her; wants a friend standing nearby to remove doll when doll comes around to her)
5. C,6,2: It's hard not to knock them down 'cause whenever I breathe I breathe them down. (Having trouble setting up a paper village)
6. Mindy, 5,6: Are you washing me blind? (As M wipes corners of her eyes)

Similarly: I'm patting her wet (by patting her, causing her to become wet), feels like you're combing me baldheaded, I'm gonna jump it down (by jumping on it, cause it to go down), don't drive off my feet (by driving over my feet, cause them to come off).

(See Bowerman, 1977 and in press c)

(i.e., composed of a single proposition). According to the other analysis, however, such sentences are complex: at an underlying level they consist of two separate propositions, one specifying a causing event, e.g., you pull (on) your socks and the other specifying a change-of-state or change-of-location that results from this event, e.g., your socks come up. The causing event and resulting event can be quite diverse; that is, many unusual combinations are acceptable in adult speech, such as the locusts ate the prairie brown and bare (from a Laura Ingalls Wilder book). So-called two-part verbs like pull up are simply very common combinations.

When we think of a certain class of two-part verbs as part of a much larger pattern of juxtaposing a causing event with a resulting change of state or of location, we see that the early appearance of productivity with these forms in child speech is misleading. This productivity is in fact limited to types of combinations of causing events and resulting events that children often hear described with sentences of this structural pattern in adult speech. Novel sentences with the same combinations can be produced on the basis of verb phrase-by-verb phrase knowledge. But the onset of errors like those in Table 1 indicates that the child has gone beyond this piecemeal approach and now recognizes an overarching pattern, a way in which these various sentences are similar both in terms of their abstract semantic

configuration and their syntactic structure. Only now is the child for the first time in a position to create truly novel exemplars cut to the same pattern. Many of the new combinations are in fact perfectly grammatical (e.g., Don't hug me off my chair, where it is unlikely the child has ever heard a sentence encoding an event in which hugging was an action that caused the hugged entity to come off something). But others, such as those in Table 1, violate certain constraints on how freely the pattern can be realized (see Bowerman, 1977, in press c, for discussion).

2. More on the expansion of existing meanings.

The two examples just discussed indicate that the child can come to recognize that diverse "small" meanings she has thus far treated independently from one another share a more abstract class meaning and that this class meaning correlates with a certain morphological or syntactic treatment. In these cases, the evidence that the child controls the class meanings is that she overregularizes: applies the formal treatment to representatives of the class meaning that for one or another reason do not allow the treatment.⁶ The process of building class meanings that encompass hitherto separate, less abstract meanings can produce symptoms other than overregularization, however. In particular, it appears to be implicated in the onset of what we may call semantic substitutions: errors in which a form that is called for on grounds of both meaning and within-sentence syntactic context is replaced by another form of the same syntactic class with a different but related meaning (Bowerman, 1978, in press c).

Substitutions of semantically related words are relatively common in adult speech, e.g., I really LIKE to -- HATE to get up in the morning; Not Thackeray but someone who wrote BELOW Thackeray -- BEFORE Thackeray (Fromkin, 1971, Fay & Cutler, 1977). It has been proposed that these occur because of a breakdown in the process of sentence production (Fromkin, 1973, introduction; Laver, 1973; Nooteboom, 1969). According to this hypothesis, the speaker's intention to communicate a certain meaning activates a set of candidate lexical items and syntactic arrangements, together with their associated phonology. At this point more lexical items may be activated than will be ultimately selected. In this case the speaker must implicitly evaluate competing items and select the semantically optimal one, rejecting the rest. Ordinarily this goes smoothly, but occasionally there is a minor lapse and an inappropriate competitor slips through in place of the optimal choice.

In Christy's and Eva's speech, substitution errors involving certain relational words such as verbs, prepositions, adjectives, locative

⁶ Notice, however, that the effects of the discovery of the class meaning are different in the two cases. For pull up, etc., the discovery leads to greater productivity than existed previously (as in the case of inflectional overregularizations like foots); for un-, however, the result is a restriction of a previously more indiscriminate productivity.

particles, and the prefix un- were recurrent. Some examples are given in Table 2.

TABLE 2
Examples of Some Types of Semantic Substitutions
(From Bowerman, 1978 and in press a)

make/let

1. C,3,9: Make me watch it. (Begging D to let her watch a TV show)
2. C,3,8: How come you always let me wear those? (As M puts C's shoes on; she had wanted another pair)

put/give

3. C,3,4: You put the pink one to me. (request for M to give her the pink one of two cups)
4. E,2,7: Give some ice in here, Mommy. Put some ice in here, Mommy. (Pointing to ice crusher)

behind for after

5. E,3,9: Can I have any reading behind the dinner?
(= will you read to me after dinner?)

verb + locative particle (out/off/down, etc.)/un- + verb

6. C,5,6: ...so I had to untake the sewing. (= take the sewing/stitches out. Telling about sewing project at school)
(Similarly: unpull [pants] = pull pants down; unget [a knot] = get a knot out)
 7. C,4,5: (Wants to move electric humidifier): I'll get it after it's plugged out. (Shortly after): Mommy, can I unplug it?
(Similarly: tuck [a blanket] out = untuck)
-

The onset of errors like these was preceded by a period ranging from a few weeks to up to two years during which both the "target" word (or morpheme) and its replacement (substitutions were often reciprocal) were used productively in semantically appropriate contexts and never interchanged. This sequence suggests a process by which initially independent words draw together on grounds of more abstract meaning relationships, such that an intention that used to activate only one word now activates another as well. In virtually all cases, the "target" element and its replacement are taxonomically related, i.e., can be seen as equivalent at a higher level of abstraction.⁷ Let and make both specify causation, but differ in the precise nature of that causation. Put and give both specify a causal act in which something changes location, but differ in whether the new location

is animate or not. Behind and after specify a parallel position in a sequence, but in the spatial vs. temporal domain, respectively. And two-part verbs with off/out/down/apart, etc., like verbs prefixed with un-, all specify actions involving the separation or spreading out of parts.

What leads to competition between forms whose meanings are taxonomically related at a higher level of abstraction, when both the existence of separate forms and the child's own past history of correct usage would seem to predict that the individual meanings associated with the forms should remain apart? This is too complex a question to discuss fully here. However, it is intriguing to note that even though the meanings involved are formally distinguished in English by the use of separate morphemes, their close relationship is attested to by the fact that they are often treated as equivalent in the formal structure of other languages. For example, some languages do not formally mark the distinction between animate and inanimate goal that is observed in give vs. put (Lyons, 1967) and some languages create causative verbs with a morpheme that is indeterminate between active causation (make) and permissive causation (let) (Comrie, 1976).

In some cases there may be no languages that encode with a single form the meanings that substitution errors indicate are similar for children beyond a certain age. Nevertheless there may still be cross-linguistic "support" for the errors: often the semantic domain defined by the substitutions is "divided up" by different languages in ways that suggest an underlying coherence masked by a somewhat arbitrary language-specificity in assigning subparts of the domain to different formal classes. The domain of "acts of separation" provides a good example. English shares with Dutch certain cognate formal devices for encoding such acts, and often uses them similarly: e.g., English UNload and cut OFF vs. the Dutch equivalents ONTladen and knip AF. However, sometimes these devices cross over unpredictably: e.g., English undress, unpack, and unhook vs. Dutch kleet uit 'dress out,' pak uit 'pack out,' and haak af/uit 'hook off/out;' and English slip out vs. Dutch ontglippen 'unslip.' (Compare these crossovers with errors 6 and 7 in Table 2).

Cross-linguistic evidence of these types indicates that children's recurrent substitution errors may arise from deep-seated cognitive predispositions towards perceiving certain kinds of similarities among events or relationships, regardless of whether these similarities are formally recognized in the language being learned. This might at first glance appear to support the notion that linguistic forms map onto meanings that are worked out independently of language. But notice that the effect of the classificational biases reflected in substitution errors is not observed in the earliest stages of language acquisition. To the

⁷ The superordinate semantic category that subsumes the more specific meanings of two or more words that substitute for each other may in many cases be best described as having a "family resemblance" structure (Rosch & Mervis, 1975) — i.e., definable in terms of a set of recurring semantic elements, not all of which are reflected in each submeaning.

contrary, in these cases the child starts out following the very specific form-meaning mappings exemplified in her local language and only much later, long after she is using the forms in question fluently, is apparently influenced by more general, nonlinguistic categorizational tendencies. The existence of such sequences, along with evidence for the converse, more expected process whereby "universal" categories are reflected in children's earliest uses of forms (Slobin, 1979), indicates that there is a complex interplay in language development between the effects of nonlinguistic cognition and experience with the language being learned.

3. Breaking down global meanings

In the two immediately preceding sections I have considered some late errors that seem to reflect processes of merging initial meanings. There is also evidence for a complementary process of change, the breaking apart of meanings that initially function in the child's system as unitary conceptual packages.

The relevant errors are of two related types. One can be termed overexplicit marking: the child moves from a period in which she routinely selects the same word that an adult would use to encode a given idea to a later period in which she occasionally, or in some cases often, expresses this meaning with a set of forms that in essence "decompose" it into two or more smaller units, each with its own explicit formal marker. Karmiloff-Smith (1979b) has observed this phenomenon in French-speaking children; one interesting example is the occasional replacement of appropriate nounphrases like mes voitures 'my cars' by clumsy paraphrases like toutes les miennes de voitures 'All (totality) the (plurality) mine (first person possessive) of cars', in which the several meaning elements that are implicit in mes are spelled out in detail. Examples from my own data (Bowerman, in press c) involve the replacement of single-word causative verbs like drop, put, and break by periphrastic forms that mark the causative meaning element with make or get and the resulting event with an intransitive predicate, e.g., I drop it → I make it fall; would you put my shoe on? → would you make my shoe come on?

The second type of error suggesting the breakdown of meanings that initially form a single conceptual unit involves redundant marking. Again, there is first a period in which the child uses the conventionally appropriate word for a given notion, followed by a later period in which she occasionally or often adds to this same word another morpheme that encodes separately an element of meaning that, from the adult point of view, is already incorporated into the original form. Some examples of redundancy following initially correct usage are shown in Table 3.

The precise cause of overexplicit and redundant marking is unclear. Karmiloff-Smith (1979b) proposes that the errors reflect the child's efforts to come to grips with meaning distinctions to which he has become newly sensitive in known words by giving each distinction its own "external handle." This explanation invokes the principle of one-to-one

TABLE 3
Redundant Marking

un- + lexical item or phrase that already encodes an act of separation

1. C,4,11: Will you unopen this? (= open. Wants D to take lid off styrofoam cooler; she can't).
2. Scott, 5,2: How do you unbreak this? (= break. Trying to pull sheet of stamps apart)
3. E,3,5: How do I untake this off? (= take this off. Trying to get out of swimsuit)

Enchoative -en with verb that already encodes notion of moving into a new state

4. E,4,11: Julie, will you closen the yellow so I can use it? (Painting with a friend; worried that yellow paint will dry out if not kept closed)
5. Matthew, 3,4: Will you straightenen this out please? (Handing adult a scrunched-up Dixie cup)

Turkish: causative suffix added to verbs that are already causative (Slobin & Aksu, 1980)

6. Adult: Kim kes - ti onu?
who cut past it-accusative

Child: (2,3): Ben kes -tir- dim
I cut causative past

Intended meaning: 'I cut (it).'

Literal meaning: 'I had (someone) cut (it).'

marking; that is, it assumes that there is push from within the child to give separate markers to each unit of meaning (of which he is aware) until a later point at which he can go back to "allow[ing] one external marker to convey several pieces of information" (1979b, p. 112). An alternative explanation is that the errors result from conflict between competing methods — lexical vs. syntactic or morphological — of encoding a certain type of meaning (Bowerman, in press a). In the case of overexplicitness, the competition is won by a periphrastic variant that is not appropriate to the particular context at hand, whereas in the case of redundancy, the two methods are incorrectly combined within the boundaries of a single sentence.

Regardless of which explanation is preferable (perhaps both are needed to account for the full range of errors), it is important to note that both of them invoke the breakdown of meanings that are initially

matched as wholes to given forms. This is an explicit part of Karmiloff-Smith's proposal. And the "competition" account also requires it. Before syntactic or morphological devices like make + intransitive predicate, un- + verb of joining (etc.), and verb + -en can become productive, they must be associated with meanings that are independent of any particular lexical item (e.g., causation, reversal of act of joining [= act of separation], enchoative [= passing into a new state]). It is reasonable, moreover, to assume that these devices are not activated in the absence of these meanings. This means that in order for competition to occur at the moment of speech between a single lexical item and a productive device -- e.g., between drop and make + intransitive predicate; open and un- + verb; or close and verb/adjective + -en -- the meaning associated with the lexical item must be represented in the speaker's head in such a way that the relevant component (cause, enchoative) or level of description (act of separation) has enough conceptual independence from the total meaning package (e.g., causation-of-falling; a particular kind of act of separation) to activate the device. That such a conceptual partitioning is achieved only after a period in which the word's meaning is represented more globally is suggested by the initial absence of such errors, often until long after the relevant productive devices are already part of the child's repertoire.

Conclusion

The error types discussed in the preceding sections show some of the ways in which the relationship between forms and meanings can change in the course of language development: matches between individual words or phrases and their specific meanings can "join up" as common instances of a match between a more abstract form and a more abstract class meaning; class meanings can develop to interconnect previously independent forms even in the absence of a shared, abstract "matching" form, and the meanings initially matched to words as unanalyzed wholes can subsequently be broken down or reanalyzed into a set of conceptually independent components or levels of characterization.

These changes take place after the child would ordinarily already be credited with having "acquired" the forms in question. This indicates that achieving fluent, productive use of a form and achieving adult-like knowledge of its structure are not necessarily isomorphic. The young child knows what to do with particular words or groups of words, and she knows many syntactic and morphological patterns, but she has not yet recognized many of the deeper relationships and regularities of the language she is learning. To judge from the time of onset of errors of various types, the work of discovering these systematicities occupies the child during most of her preschool years and even beyond.

Evidence for the reorganization and progressive deepening of linguistic knowledge has implications for several theoretical issues. Two that have been considered in this paper are the role of communication and the role of meaning in the acquisition of language. With respect to communication, I have argued that the currently prevalent invocation of "communicative need" to account for the child's linguistics

tic progress is insufficient: how can it explain the child's further analyses of linguistic forms that are already well under control for purposes of everyday communication (see also Karmiloff-Smith, 1979a, b) -- especially when the primary behavioral evidence of these analyses is errors where there were none before? The onset of late errors is also difficult to square with other accounts of the driving force behind progress in language acquisition, such as parental correction and reinforcement or the child's perception of a mismatch between the predictions of her own mental grammar and adult speech.

What shall we conclude from this? Almost a decade ago, Brown (1973) discussed the question of whether linguistic progress comes about through selection pressures of various kinds and, in light of the lack of positive evidence, proposed a "radically different possibility [:]... that children work out rules for the speech they hear, passing from levels of lesser to greater complexity, simply because the human species is programmed at a certain period in its life to operate in this fashion on linguistic input" (p.412). I believe that the evidence presented in this paper strongly supports this general conclusion, and would add only the qualification that it is not yet clear whether there is "critical period" for analyses of the types discussed.

With respect to meaning, I have pointed out some difficulties with the currently prevalent view that language acquisition is a process of mapping linguistic forms onto meanings already worked out on a nonlinguistic basis. While this view is certainly on the right track in emphasizing the importance to language acquisition of the child's cognitive development and conceptual predispositions, it is deficient in its implicit assumption that "meaning in language" is isomorphic with "what the child knows on a nonlinguistic basis (and wants to communicate)." Meaning in language is undeniably dependent upon nonlinguistic cognition, but it is at the same time a highly structured and conventionalized system. This means that the child cannot afford to prejudge what meaning categories will be important any more than he can afford to prejudge the formal linguistic devices with which he will have to deal. Both are equally part of what he must learn. Since forms and meanings are often intricately interrelated, with each one defining the boundaries of the other, we can expect that the transformation of the child's world knowledge into the categories of meaning functional in his local language involves complex interactions between linguistic input and nonlinguistic biases and constraints. And indeed this is precisely what late errors suggest. How this process takes place is an aspect of language development that we have barely begun to explore, however. I hope the coming years will see more attention paid to this fascinating puzzle.

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